DESCRIPTION

PARTITIONING MEMBER AND CONTAINER USING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit pursuant to 35 U.S.C. §119 (e) of U.S. Provisional Application No. 60/501031 filed on September 9, 2003, and priority is claimed on Japanese Patent Application No. 2003-311780 filed on September 3, 2003, Japanese Patent Application No. 2004-234367 filed on August 11, 2004, and Provisional U.S. Patent Application No. 60/501,031 filed on September 9, 2003, the contents of which are incorporated herein by reference.

TECHNICAL FIELD

The present invention relates to a partitioning member. More specifically, the present invention relates to a partitioning member capable of unfailing separating the contents, such as medicament and food, housed in a plurality of chambers before use and swiftly communicating the chambers to mix the contents immediately before use, and also relates to a container using the partitioning member.

BACKGROUND ART

With respect to the container used in the medical or food field, a container where a plurality of contents are housed in a plurality of chambers and respective contents are not mixed before use but can be easily mixed on use is known.

For example, in the medical field, at the time of preparing an infusion medicament

by mixing a plurality of medicaments immediately before administering the infusion medicament, it is demanded to prevent foreign matters or miscellaneous bacteria from mixing into the infusion medicament. As for the infusion container capable of mixing a plurality of medicaments in a sterile environment, there is known an infusion container with multiple chambers, where the inner wall surface of a bag container formed of a synthetic resin-made film is heat-sealed and by using the produced seal parts as partition parts, medicaments are housed in a plurality of chambers partitioned by the seal parts within the bag container. According to this infusion container with multiple chambers, the seal parts partitioning respective chambers are peeled open to unite the chambers within the container into one chamber, whereby respective medicaments can be mixed.

In such an infusion container with multiple chambers, respective medicaments must be unfailingly separated from each other until the infusion. Therefore, the partition part in the infusion container with multiple chambers is required not to be readily peeled open during ordinary handling before infusion, for example, during washing, partial filling, sterilization, transportation or storage of the infusion container with multiple chambers. On the other hand, it is necessary that at the time of mixing the medicaments, the partition part produced by heat sealing is peeled open by itself without damaging the container body.

As for the partition part capable of satisfying these requirements, an infusion container with multiple chambers using seal parts produced by separably heat-sealing a synthetic resin film has been proposed. Known examples of the seal part proposed include an easy-peelable seal part produced by heat-bonding the inner surface of a bag container which is obtained by mixing two or more synthetic resins having low compatibility with each other and then shaping the mixture (Japanese Unexamined Patent

Application, First Publication No. S63-19149), and a seal part produced by laminating a separate film on the inner surface of a container to serve as a layer undertaking the functions of melt-sealing and unsealing (Japanese Unexamined Utility Model Application, First Publication No. H5-5138).

However, the adjustment of peel strength of these seal parts to a desired low peel strength range is accompanied with a narrow latitude in selecting the production conditions for the seal part. Accordingly, if the production conditions are out of the predetermined range and the peel strength is less than the desired low peel strength, the seal part is sometimes peeled open before infusion, whereas if the peel strength exceeds the desired low peel strength, the seal part may not be easily peeled open when mixing respective medicaments.

As for the infusion container with multiple chambers capable of solving these problems, there has been proposed a container where the partition part used for partitioning respective chambers is not a seal part but a partitioning member comprising a resin shaped article. For example, a partition part having a communicating hole, which is formed by unseparably melt-sealing the middle part of a container, is disclosed, where a pipe closed at one end is provided in the communicating hole and two chambers can be communicated on use by breaking off the pipe (Japanese Unexamined Patent Application, First Publication No. H4-364851, particularly, FIGS. 12 and 13). Also, a partition part having a constitution such that an isolation wall having a communicating hole closed with a force-down member and the communicating hole is opened by bending down the force-down member from the outside of the container is disclosed (Japanese Unexamined Patent Application, First Publication No. H6-197938).

However, the pipe or force-down member provided in the partition portion may

be damaged before infusion due to a force imposed from the outside of the container. Furthermore, for enabling relatively easy breaking off of the pipe or force-down member, the pipe or force-down member itself must be made thin by reducing the hole diameter, but this is accompanied with a limitation in the flow of a medicament passing through the communicating hole and a problem arises in that the operation of mixing the medicaments takes time.

As for the partitioning member capable of solving the problems in these conventional resin-made partitioning members, there is disclosed a partitioning member where a hollow part capable of communicating two containers and a lid body stopping one end of the hollow part are formed and a thin wall part is formed in the connection part between the lid body and the partitioning member main body (Japanese Unexamined Patent Application, First Publication No. 2001-87350).

FIG. 12 shows one example of the infusion container with multiple chambers according to the invention of Japanese Unexamined Patent Application, No. 2001-87350, which is using this partitioning member. The container 21 of this example is obtained by integrating a first housing part 22 having formed in the inside thereof a chamber for housing a liquid medicament and a second housing part 23 having formed in the inside thereof a chamber for housing a powder medicament, and this container has a partitioning member 24 for partitioning the first housing part 22 and the second housing part 23.

The partitioning member 24 is formed to be flat and long in the cross direction of the container 21. This partitioning member 24 comprises a partitioning member main body 24a having a hollow part capable of communicating the first housing part 22 and the second housing part 23 and a lid body 24b provided in the opening part of the partitioning member main body 24a, and the opening part of the partitioning member 24 has a boat-like

cross section.

In the partitioning member 24, forces in the same direction are applied to both end parts of the partitioning member 24 toward the thickness direction of the container and a force is similarly applied to the center part of the partitioning member 24 toward the direction reversed to the above-described direction to bend the partitioning member 24 into a dogleg shape, whereby a thin wall part 24c formed in the connection part between the lid body 24b and the partitioning member main body 24a can be ruptured and the lid body 24b can be opened to the outer side of the partitioning member. After the opening of lid, the first housing part 22 is pressed to move the liquid medicament and thereby peel open the weak seal part 25 adjacent to the second housing part 23, as a result, the first housing part 22 and the second housing part 23 are communicated and two medicaments can be mixed.

The partitioning member of Japanese Unexamined Patent Application, First Publication No. 2001-87350 is characterized in that when a force is applied to the entire container, the thin wall part 24c is not ruptured to open the lid body and communicate two containers and also in that the communicating cross-sectional area is wide and the contents can be swiftly mixed, because by applying a force to the partitioning member main body 24a and causing large bend deformation, the thin wall part 24c is ruptured to open the lid body and communicate two housing parts through the partitioning member.

In producing a container with multiple chambers by using the partitioning member described in Japanese Unexamined Patent Application, First Publication No. 2001-87350, a support member for maintaining the shape of the hollow part of the partitioning member is inserted from the opening part in the side where the lid body 24b is not formed. By inserting this support member, the shape of the hollow part of the partitioning member main body can be maintained at the time of melt-sealing a container

to the partitioning member and a plurality of containers can be melt-sealed to the partitioning member without a gap. However, this partitioning member has a problem in that the support member may fall off from the partitioning member main body before melt-sealing a container to the partitioning member and the container cannot be melt-sealed to the partitioning member or in that after the content is filled in the container, the support member or lid body 24b may fall off from the partitioning member and float in the container and this support member or lid body 24b may be regarded as a foreign matter.

Also, in producing a container by using the partitioning member described in Japanese Unexamined Patent Application, First Publication No. 2001-87350, the insertion of the support member is usually an essential matter and therefore, it is necessary that the production process includes a step of inserting and removing the support member.

Furthermore, in this step, a supporting jig comprising a metal is often used for the support member and this may cause a problem that a resin powder is generated upon contact between the supporting jig and the resin-made partitioning member and the resin powder gives rise to a foreign matter in the container.

The present invention has been made under these circumstances and an object of the present invention is to provide a partitioning member capable of gaplessly melt-sealing a plurality of containers to the partitioning member even without a support member. Another object of the present invention is to provide a partitioning member free from floating of a foreign matter in the container after communicating the containers. Still another object of the present invention is to provide a container using the partitioning member, where the contents housed in a plurality of containers can be unfailingly separated before use and respective contents can be easily mixed while keeping the sterile

state on use.

DISCLOSURE OF INVENTION

The present inventors have made intensive studies on the partitioning member capable of realizing the above-described objects, that is, for example, two containers can be melt-sealed to the partitioning member even without a support member, as a result, it has been found that when a partition body for partitioning a hollow part of a partitioning member main body is provided at a portion except for both ends of the hollow part, the shape of the hollow part of the partitioning member main body can be maintained even if a support member is not inserted, and a plurality of containers can be gaplessly melt-sealed to the partitioning member. It has been also found that by virtue of this constitution, the step of inserting and removing the support member can be dispensed with and the container can be produced advantageously by a simplified production process at a low production cost.

Furthermore, it has been found that when a thick wall part is formed in a part of the connection part between the partition body and the partitioning member main body or a support member is melt-sealed to two opening parts of the partitioning member main body, the partition body stays in the hollow part and therefore, after two containers are communicated, the partition body does not float as a foreign matter in the container. The present invention has been accomplished based on these findings.

That is, the first invention of the present invention is a partitioning member for partitioning a plurality of adjacent housing parts, comprising a partitioning member main body having a hollow part capable of communicating a plurality of adjacent housing parts and a partition body for partitioning the hollow part, wherein the partition body is provided

at a portion except for the vicinity of openings of the partitioning member main body, and the partition body and the partitioning member main body are connected through a thin wall part.

The second invention of the present invention is the partitioning member according to the first invention, wherein a thin wall part and a thick wall part are formed in the connection part between the partition body and the partitioning member main body.

The third invention of the present invention is the partitioning member according to the first or second invention, wherein the partition body in a tabular shape is inclined with respect to the plane formed by the opening of the partitioning member main body.

The fourth invention of the present invention is the partitioning member according to any one of the first to third inventions, wherein the partitioning member main body has a tubular and flat shape and in both side parts of the partitioning member main body, a projection strip is provided to protrude from the partitioning member main body to the outer side.

The fifth invention of the present invention is the partitioning member according to any one of the first to fourth inventions, wherein at least one support member is housed in the hollow part of the partitioning member main body.

The sixth invention of the present invention is the partitioning member according to the fifth invention,, wherein a thin strip is provided at one end or both ends of the support member.

The seventh invention of the present invention is the partitioning member according to the sixth invention, wherein one end of the support member in the side not having the thin strip and one end of the opening part of the partitioning member main body are connected through a connection part.

The eighth invention of the present invention is the partitioning member according to any one of the fifth to seventh inventions, wherein the support member comprises a plurality of ribs and a connection member which connects these ribs in series, and wherein the connection member is divided into two or more parts in the vicinity of the center of the hollow part.

The ninth invention of the present invention is the partitioning member according to any one of the fifth to seventh inventions, wherein a plurality of ribs are connected at both ends, and a constitution is made having a spring-like structure which continuously extends in a roughly triangular cross-sectional shape.

The tenth invention of the present invention is the partitioning member according to any one of the first to ninth inventions, wherein the transversal cross section of the partitioning member main body has any one shape selected from the group consisting of a boat form, a rhombic form, an elliptical form and a circular form.

The eleventh invention of the present invention is the partitioning member according to any one of the first to tenth inventions, wherein the thin wall part is a member which is ruptured as a result of bend deformation of the partitioning member main body.

The twelfth invention of the present invention is a container comprising the partitioning member according to any one of the first to eleventh inventions.

The thirteenth invention of the present invention is the container according to the twelfth invention, which is a medical container or a food container.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing one example of the partitioning member of the present invention.

FIG. 2 is a view showing an example of the partitioning member of the present invention.

FIG. 3 is a view showing the partitioning member of the present invention where a projection strip is provided in the side face part.

FIG. 4 is a view showing the partitioning member of the present invention where the partition body is provided to incline with respect to the plane formed by the opening.

FIG. 5 is a view showing the partitioning member of the present invention where the partition body is disposed obliquely with respect to the plane formed by the opening.

FIG. 6 is a view showing another example of the partition body in the partitioning member of the present invention.

FIG. 7 is a view showing another example of the partitioning member of the present invention.

FIG. 8 is a view showing an example of the support member for use in the present invention.

FIG. 9 is a view showing the state where a force is applied to the partitioning member of the present invention.

FIG. 10 is a view showing an example of the container of the present invention.

FIG. 11 is a view showing another example of the container of the present invention.

FIG. 12 is a view showing an example of a conventional infusion container with multiple chambers.

FIG. 13 is a view showing another embodiment of the partitioning member of the present invention.

FIG. 14 is a view showing another embodiment of the partitioning member of the

present invention.

FIG. 15 is a view showing another embodiment of the partitioning member of the present invention.

FIG. 16 is a view showing another embodiment of the partitioning member of the present invention.

MODES FOR CARRYING OUT THE INVENTION

The present invention is described in detail below by referring to the drawings.

FIGS. 1 and 2 show one example of the partitioning member according to the present invention. FIGS. 1A and 1B are perspective views of the partitioning member of this example, FIG. 2A is a front view, FIG. 2B is a plan view, FIG. 2C is a side view, and FIG 2D is another front view viewed from the opposite side in FIG. 2A. The partitioning member 1 comprises a partitioning member main body 2 having a hollow part 3 capable of communicating a plurality of adjacent containers and a partition body 4 for partitioning the hollow part 3 at the center of the hollow part. The partition body 4 is provided at the portion except for openings 7 of the partitioning member main body. The partition body 4 and the partitioning member main body 2 are connected through a thin wall part 5. The partitioning member 1 of this example is used as the partitioning member 24 of a container 21 shown in FIG. 11.

The construction material of the partitioning member 1 is selected from synthetic resins satisfying the requirements that the partitioning member can be deformed on receiving a stress without causing breakage of the partitioning member main body, a foreign matter is not generated after the rupture of thin wall part and the partitioning member can be melt-sealed to the film of a container-forming material, and from the aspect

of contents, satisfying the requirements that the partitioning member does not dissolve out into the contents, not adsorb the contents and not decompose the contents. Specific examples of the synthetic resin include polyolefins such as polyethylene and polypropylene, polyesters such as polyethylene terephthalate, polybutylene terephthalate, polyethylene naphthalate and alicyclic copolyester, thermoplastic resins such as polysulfone, polyethersulfone and cyclic polyolefin, and a mixture thereof. Among these synthetic resins, polyolefins and cyclic polyolefins are preferred because these have good sealing property to the container-forming material and cause no effect on the contents. In the case of using a polyolefin, a high-density polyethylene is more preferred.

The partitioning member main body 2 usually has a tubular and flat shape. The cross-sectional shape is sufficient if it has a hollow part capable of communicating a plurality of housing parts. In the example of FIG. 1, the cross-sectional shape is a boat form, but the present invention is not limited thereto. At both ends, an opening 7 is provided. The outer face of the partitioning member main body 2 is afterward sealed with a container.

In the partitioning member main body 2, the cross section cut along the plane 7a formed by the opening of the partitioning member main body has a flat boat shape which is wide when viewed from the plan direction and is slender when viewed from the side face direction. The "plane 7a formed by the opening of the partitioning member main body" as used herein means a flat face, as shown by the slanting line part of FIG. 1B, formed by the opening 7 of the partitioning member main body and this plane is usually perpendicular to the wall face 2a of the partitioning member main body shown in FIG. 1B. When viewed from the front direction, as shown in FIG. 2A, the partitioning member is making a dogleg shape at the side part 8 on the outer surface and becomes narrower as closer to the

end. In the partitioning member main body 2 of this example, two inclined faces 8a are formed at the side part 8. By providing these inclined faces 8a, at the time of heat-sealing the partitioning member 1 with a container, the film constituting the container can be prevented from generation of a pinhole in the A-shaped part and this is advantageous for gaplessly melt-sealing the synthetic resin-made film to the partitioning member 1.

At both side parts of the partitioning member main body 2, a projection strip 9 is preferably provided to protrude therefrom toward the outer side. FIGS. 3A and 3B are a front view and a plan view, respectively, of a partitioning member main body 2 where projection strips 9 are provided. As shown in FIG. 3A, the projection strip 9 is more preferably provided to protrude from the side part 8 toward the vertical direction with respect to the thickness direction of the flat partitioning member main body 2 (or to protrude in parallel with the horizontally long cross direction of the flat partitioning member main body 2) and become thinner as proceeds from the junction part with the side part 8 to the outer side. By virtue of such a constitution, not only the film constituting the container can be prevented from generation of a pinhole in the A-shaped part but also the film can be strongly melt-sealed to the partitioning member 1.

The partitioning member 1 of the present invention is deformed by imposing thereon a stress so as to achieve communication through the partitioning member 1. At the time of deforming the partitioning member 1, the film of the container-forming material is also dragged, as a result, a force is yielded to peel off the partitioning member 1 from the seal part of the film, but the container strongly sealed together with projection strips 9 can resist such a peeling force.

The partition body 4 is held through a thin wall part 5 in the connection part to the partitioning member main body 2. The partition body 4 is used for partitioning the

hollow part 3 of the partitioning member main body 2 and is provided at a portion except for opening ends of the hollow part 3, in other words, at a portion except for the vicinity of openings 7 of the partitioning member main body. As shown in FIGS. 1 and 2, the partition body 4 is not provided to close the end part of the hollow part 3 but is provided in the middle part in the vertical direction of the hollow part 3 in FIG. 2B, preferably nearly at the center of the hollow part 3.

The partition body 4 is a member for unfailingly separating the contents in the container before use, which prevents the partitioning member 1 from deforming together with the thin wall part 5 at the time of melt-sealing the partitioning member 1 with the film. In this way, the partition body 4 has a function of resisting the deformation of the partitioning member 1 at melt-sealing. On the other hand, as described in detail later, the partitioning member 1 of the present invention also has a function of bringing about bend deformation into a dogleg shape upon application of a force and rupturing the thin wall part 5 to communicate a plurality of containers. At this time, the function of the partition body 4, namely, the function of resisting deformation of the partitioning member 1 at melt-sealing, antagonizes the function of the partitioning member 1, namely, the function of bringing about bend deformation into a dogleg shape upon receipt of a force and rupturing the thin wall part 5 to communicate a plurality of containers. In other words, as the force of the partition body 4 for resisting the deformation of the partitioning member 1 at melt-sealing is larger, it becomes more difficult to cause rupturing of the thin wall part 5 and in turn, communication of a plurality of containers partitioned by the partitioning member 1.

For the purpose of adjusting these antagonistic two functions to render the partition body 4 sufficiently strong against deformation of the partitioning member 1 at

melt-sealing and at the same time, facilitate the communication of a plurality of containers, as shown in FIG. 4B, the partition body 4 may be provided to incline with respect to the plane 7a formed by the opening of the partitioning member main body when the partitioning member 1 is viewed from the side face direction. FIG. 4A is a plan view of such a partitioning member 1 and FIG. 4B is a side face view. At this time, the partition body 4 in the planar form is not in parallel with the plane 7a formed by the opening of the partitioning member main body. By providing the partition body 4 while inclining it, the thin wall part 5 is readily ruptured and the communication is facilitated. The inclination angle L of the partition body 4 shown in FIG. 4C is preferably determined appropriately by taking account of the construction material of partitioning member 1, the thickness of thin wall part 5, the size of partitioning member 1 and the like. For example, this angle is from 45 to 88°, preferably from 55 to 85°, more preferably from 65 to 83°.

As the inclination angle L is smaller, the partition body 4 decreases in the function of resisting the deformation of the partitioning member 1 at melt-sealing, as a result, the partitioning member 1 at melt-sealing undergoes shear deformation in the same direction as when receiving a shear force. For example, in the case of a partitioning member 1 where the partition body 4 is inclined as shown in FIG. 4B, the force at melt-sealing is applied from right and left both directions and at this time, the partitioning member 1 undergoes deformation in the right upper direction and the left lower direction as shown by arrows in FIG. 4B. The directions to which deformation occurs are determined by the inclination direction of the partitioning member 1.

The shear deformation can be suppressed when the melt-sealing is performed by fixing the partitioning member 1 and using a jig for preventing the shear deformation or making large the wall thickness in the side face part of the partitioning member 1. By

suppressing the shear deformation in this way, the function of resisting the deformation at melt-sealing can be more unfailingly maintained even after the inclination angle L becomes less than 90°, without decreasing the function of the partitioning member 1 at all, that is, the function of bringing about bend deformation into a dogleg shape upon receipt of a force and rupturing the thin wall part 5.

In the partitioning member 1 of the present invention, as shown in FIG. 5A, the partition body 4 may also be disposed obliquely with respect to the plane formed by the opening 7 of the partitioning member main body when the partitioning member 1 is viewed from the plan direction. FIG. 5A is a plan view of such a partitioning member 1 and FIG. 5B is a side face view. Also in this case, the partition body 4 in the planar form is not in parallel with the plane 7a formed by the opening of the partitioning member main body. By this disposition, the above-described antagonistic two functions can be adjusted to render the partition body 4 strong against the deformation of the partitioning member 1 and at the same time, facilitate the communication of a plurality of containers.

Also, the partition body 4 may be provided to incline with respect to the plane 7a formed by the opening of the partitioning member main body when the partitioning member 1 is viewed from the side face direction and also when viewed from the plan direction.

The partition bodies 4 described above all have a tabular shape, but the partition body may be a dogleg-shaped partition body 4A as shown in the plan view of the partitioning member 1 of FIG. 6A or a convex curved face-shaped partition body 4B as shown in the plan view of the partitioning member 1 of FIG. 6B and the shape thereof is not particularly limited. When the partition body 4 has a shape other than the tabular shape, the partitioning member main body 2 can be more suppressed in the deformation

upon receipt of a force at melt-sealing.

In the technique of Japanese Unexamined Patent Application, First Publication No. 2001-87350, at the production of a container by using a partitioning member where a lid body is used as the partition body, the container must be produced by positioning the lid body to always face a fixed side, for example, the inner side of the container, whereas in the present invention, the partition body is provided to a position of partitioning the hollow part and therefore, the positioning of the partitioning member to face a specified direction with respect to the container is not necessary.

The thin wall part 5 formed in the connection part between the partition body 4, 4A or 4B and the partitioning member main body 2 is a portion rendered rupturable by an external deformation operation for the partitioning member 1. The thickness of the thin wall part is preferably on the order of 0.05 to 0.25 mm, more preferably from 0.07 to 0.20 mm. If the thickness is less than 0.05 mm, not only the shaping of the partitioning member 1 becomes difficult but also the rupturing may occur due to self weight of medicament or the like or due to inner pressure at the retort sterilization of container and this is not preferred. On the other hand, if the thickness exceeds 0.25 mm, an unduly large force is disadvantageously required at the operation of deforming the partitioning member.

In the partitioning member 1 of the present invention, as shown in the front view of FIG. 2D, the connection part between the partition body 4 and the partitioning member main body 2 may also be constituted such that a part is a thick wall part 6 and the remaining is a thin wall part 5. By taking such a constitution, when the partitioning member main body 2 is bent and deformed, only the thin wall part 5 is ruptured but the thick wall part 6 is not ruptured and the partition body 4 does not fall off from the

partitioning member main body 2 and stays in the hollow part 3 without fail, as a result, the partition body 4 does not float as a foreign matter within the container after opening the lid. At the same time, the thick wall part 6 is provided in the connection part not to again close the hollow part 3 after the rupture of the thin wall part 5.

FIG. 7 shows another one example of the partitioning member according to the present invention. The members having the same reference numerals as in the example of FIG. 1 denote the same members and the description thereof is omitted here.

The partitioning member 1 of FIG. 7A has two support members 10. At both ends of each support member 10, a thin strip 11 is provided. FIG. 7A is a perspective view of the partitioning member 1 showing the state where the support members 10 are inserted into the hollow part 3, and FIG. 7B is a plan view of the partitioning member 1 showing the state where the support members 10 are inserted into the hollow part 3.

In the hollow part 3 of the partitioning member main body 2 of the present invention, at least one, preferably one or two, support members 10 is provided. By the support member 10, the partitioning member main body 2 can be more unfailingly prevented from deformation at the time of melt-sealing the partitioning member main body 2 with a container and the thin wall part 5 can be prevented from deformation or breakage when an excess force is applied at melt-sealing. This is, for example, a support member shown in the enlarged view of FIG. 8.

As shown in FIG. 9A, this support member 10 is disposed to lie along the vertical (width) direction of the opening 7 when the partition member main body 2 is viewed from the front. The support member 10 enlargedly shown in FIG. 8A comprises a plurality of ribs 10a and a connection member 10b extending in the longitudinal (length) direction of the opening 7 so as to connect respective center parts of the ribs 10a.

Such a support member 10 is inserted into the hollow part 3 at the opening 7 portion of the partitioning member main body, as a result, when a force is applied to the entire partitioning member 1, the ribs 10a can prevent the hollow part 3 from deformation of the shape.

By providing the support member 10 in the hollow part 3, the shape of the hollow part 3 can be maintained at the time of heat-sealing the outer face of the partitioning member 1 with a container, so that the partitioning member 1 can be prevented from distortion of the outer face due to pressure at heat-sealing and the generation of gaps or mottles on the heat-sealed face can be inhibited. As shown in FIG. 8A, the ribs 10 may be provided at the same upper and lower portions with respect to the connection member 10b or as shown in FIG. 8B, the ribs 10a may be provided alternately with respect to the connection member 10b.

Also, as shown in FIG. 7B, when the partitioning member 1 is viewed, the length in the vertical direction (thickness) of the support member 10 is not particularly limited but is preferably 1/4 or less of the length in the vertical direction (height) of the hollow part 3 before communication.

The support member 10 is preferably joined with the partitioning member main body 2. By joining it, the support member 10 and the partitioning member main body 2 are integrated and the support member 10 does not fall off from the partitioning member 1, so that the partitioning member main body 2 can be more unfailingly prevented from deformation at the operation of melt-sealing the partitioning member 1 with a container. The joining may be performed, for example, by a method of providing a catching part between the partitioning member main body 2 and the support member 10, but since the partitioning member 1 undergoes deformation, in order to more ensure the joining, those

are preferably integrated by melt-sealing. More specifically, for example, as shown in FIG. 8C, a thin strip 11 capable of melt-sealing and joining to the partitioning member main body 2 is suitably provided at one end, preferably both ends, of the support member 10. By virtue of this constitution, the end face 9a of the projection strip shown in FIG. 3A or the end face 8b in the side part can be melt-sealed to the thin strip 11 provided at one end or both ends of the support member 10. In this way, by melt-sealing the support member 10 to the partitioning member main body 2 through the thin strip 11, the support member 10 can be prevented from falling off from the partitioning member main body 2.

Furthermore, in order to more firmly melt-seal and integrate the support member 10 to the partitioning member main body 2, as shown in FIG. 8C, the thin strip 11a of rib is also preferably provided at the end part of the lib 10a in addition to the end part of the support member 10.

The support member 10 is required not only to achieve the reinforcement so that the partitioning member main body 2 can be prevented from deformation at melt-sealing by receiving a force F in the perpendicular direction shown in FIG. 9A, but also not to give an excessive resistance against the dogleg-like bending shown in FIG. 9B. In this meaning, for example, if the resistance against the dogleg-like bending is excessive, the force necessary for the bending can be reduced by alternately providing the ribs as shown in FIG. 8B or decreasing the number of ribs 10a.

As shown in FIG. 7A, when two support members 10 are provided in the hollow part 3 of the partitioning member main body 2, the partition body 4 fallen off as a result of rupture of the thin wall part 5 is trapped in the hollow part 3 formed by two support members 10 and the partitioning member main body 2 and does not flow out into the bag part of the container, so that the contents can be prevented from being judged as containing

a foreign matter.

In the above-described specific example, the cross section cut along the plane 7a formed by the opening of the partitioning member main body has a boat shape, but as other examples of the partitioning member, the cross section may have a rhombic shape, an elliptical shape or a circular shape.

In the partitioning member 1 of the present invention, when a stress is applied perpendicularly to the communication direction of the partitioning member 1, the thin wall part 5 is ruptured to communicate a plurality of containers.

Particularly, the partitioning member preferably has a mechanism such that as shown in FIG. 9B, when a force is applied to bend the partitioning member 1 into a dogleg shape by applying forces F1 in the same direction to the end part in the cross direction at both sides of the partitioning member 1 toward the thickness direction of the container and at the same time, applying a force F2 to the center part in the cross direction of the partitioning member 1 toward the direction reversed to that at end parts in the cross direction, different stresses are generated from the partition body 4 and the partitioning member main body 2, respectively, against the external force and due to this difference in the stress, the thin wall part 5 in the connection part between the partition body 4 and the partitioning member main body 2 can be ruptured. That is, a partitioning member 1 where the thin wall part 5 is ruptured by the bending of the partitioning member 1 is preferred.

The cross-sectional shape of this partitioning member 1 which is bent is not particularly limited, but since the container using this is required to be somewhat flat in the cross direction, in the partitioning member 1 shown in FIG. 2A, the (length in the longitudinal direction/length in the vertical direction) ratio of the partitioning member 1 is

preferably 3 or more. Also, since the force is manually applied in almost all cases, the length in the longitudinal direction is preferably on the order of 3 to 20 cm. The longitudinal direction as used herein indicates, in the container of FIG. 11, the cross direction of the container, and the vertical direction indicates, in the container of FIG. 11, the thickness direction of the container.

In the partitioning member 1 of the present invention, when the partition body 4 is in a tabular shape and is inclined with respect to the plane 7a formed by the opening of the partitioning member main body and the partitioning member 1 has a support member 10 and has a cross-sectional shape capable of allowing communication on bending, at the time of applying forces toward the same direction (see, FIG. 9A) as that at the melt-sealing of a container to the partitioning member 1, the easy rupturability of the thin wall part 5 by virtue of the inclination of the partition body 4 can be suppressed due to the deformation-preventing action of the partitioning member main body 2 by virtue of the support member 10 and at the same time, the force necessary for rupturing the thin wall part 5 by bending scarcely increases. Accordingly, this is a very excellent partitioning member 1 which is weak against the bending (communicating operation) shown in FIG. 9B and very strong against the compression (melt-sealing operation) shown in FIG. 9A.

Also, a partitioning member 1 of an opposite type to the partitioning member of allowing the communication by bending may be constituted, that is, a partition body 4 is connected to a partitioning member main body 2 through a thin wall part 5 in the state that the partitioning member 1 is bent as shown in FIG. 9B, and by applying forces toward the directions reversed to F1 and F2 of FIG. 9B, the partitioning member main body 2 is deformed into a planar shape shown in FIG. 9A to thereby rupture the thin wall part 5. In this partitioning member 1, the bent state is deformed into the planar state and therefore, it

is clear to what degree the deformation is made. Accordingly, for example, by applying an external force to the vicinity of a bending apex on the plane, excessively large deformation of the partitioning member 1 can be easily suppressed.

The partitioning member 1 of the present invention can be produced by injection molding. In one specific example, as shown in FIG. 7C, the partitioning member including the support member 10 of the present invention is preferably molded integrally as a single member. In the example of FIG. 7C, one end of the support member 10 in the side where a thin strip 11 is not provided is connected to one end of the opening part 12 of the partitioning member main body 2 through a connection part 13. This connection part 13 can flex and the support member 10 can be inserted into the hollow part 3 at the opening 7 of the partitioning member main body. The connection part 13 is thin-walled to an extent of enabling the flexure and this connection part 13 is used, similarly to the thin strip 11, as the junction part in melt-sealing and integrating the partitioning member main body 2 with the support member 10.

The shape of the support member housed in the partitioning member main body may also be that as shown in FIG. 13, for example. The support member 31 shown in FIG. 13A comprises a plurality of ribs 31a, and a connection member 31b which extends in the right-and-left (length) direction of an opening 33 of a partitioning member main body 32 which constitutes a partitioning member 30 so as to connect the center portions of the ribs 31a. A constitution is made in which such a connection member 31b is divided into two portions at the center portion of the partitioning member main body 32.

Since this support member 31 is constructed such that the connection member 31b which connects the ribs 31a is divided into two portions at the center portion of the partitioning member main body 32, when the containers are made to communicate, as

shown in FIG. 13B, a force F1 in the same direction as the thickness direction of the container is applied to the end portions in the width direction of both sides of the partitioning member 30, and a force F2 in the reverse direction of the end portions of the width direction is simultaneously applied to the center portion in the width direction of the partitioning member 30. The outside force which bends the partitioning member 30 into a dogleg shape ends up being small in comparison with the support member 10 shown previously in FIG. 7. Since the partitioning member 30 is easily bent and the containers are made to communicate, it is possible to greatly improve the handleability.

The shape of the support member housed in the partitioning member main body may also be that as shown in FIG. 14, for example. In other words, the support member 41 shown in FIG. 14A comprises a plurality of ribs 41a, and a connection member 41b which extends in the right-and-left (length) direction of an opening 43 of a partitioning member main body 42 which constitutes the partitioning member 40 so as to connect the center portions of the ribs 41a. An inclined portion 41c, in which the width of the rib 41a tapers, is formed on the side of the rib 41a which faces a partitioning body 45 on the side opposite the opening 43. Both ends of the support member 41 are connected to the partitioning member main body 42.

By forming the inclined portion 41c at the partitioning body 45 side of the rib 41a, if the partitioning member 40 is bent as shown in FIG. 14B in order to make the containers communicate, then the support member 41 detaches from the partitioning member main body 42 to the outside by the action of the inclined portion 41c, and a state of communication is achieved by means of the partitioning body 45 separating from the partitioning member main body 42. By means of this constitution, the small outside force applied to the partitioning member 40 easily makes the partitioning member 40 bend, and

the containers are made to communicate. Therefore, it is possible to greatly improve the handleability.

The shape of the support member housed in the partitioning member main body may also be as that shown in FIG. 15, for example. The support member 51 shown in FIG. 15A connects a plurality of ribs 51a at both ends at an incline, and is housed in a partitioning member main body 52 by forming a spring-like structure which continuously extends in a roughly triangular cross-section. As shown in FIG. 15B, by applying a force F1 in the same direction as the thickness direction of the container to the end portions in the thickness direction of both sides of the partitioning member 50, and simultaneously applying a force F2 in the reverse direction of the end portions of the width direction to the center portion in the width direction of the partitioning member 50, such a support member 51 causes the partitioning member 50 to curve. As a result, the angles of the ribs 51a change and increase similar to a spring, the partitioning member 50 easily bends by a small outside force, and the containers are made to communicate. Therefore, it is possible to greatly improve the handleability.

The shape of the support member housed in the partitioning member main body may also be as that shown in FIG. 16, for example. The support member 61 shown in FIG. 16A is constructed such that a plurality of ribs 61a are formed on both sides of a connection member 61b which extends in the right-and-left (length) direction of an opening 63 of a partitioning member main body 62. As shown magnified in FIG. 16C, in the connecting portion between the connection member 61b and the ribs 61a, a structure is made having a narrow portion 61c in which the width (right-and-left direction in FIG. 16C) of the ribs 61a becomes narrow, and when stress is applied, the ribs 61a easily fall toward the connection member 61b at this narrow portion 61c.

By forming the narrow portion 61c in the connecting portion between the connection member 61b and the ribs 61a, as shown in FIG. 16B, by applying a force F1 in the same direction as the thickness direction of the container to the end portions in the width direction of both sides of the partitioning member 60, and simultaneously applying a force F2 in the reverse direction of the end portions in the width direction to the center portion in the width direction of the partitioning member 60, then the partitioning member 60 is made to bend. As a result, the ribs 61a easily fall toward the connection member 61b at the narrow portion 61c, the partitioning member 60 easily bends by a small outside force, and the containers are made to communicate. Therefore, it is possible to greatly improve the handleability. The width of the narrow portion 61c may also be set to about 10-60% of the width of the normal part of the ribs 61a.

The container of the present invention uses at least one partitioning member of the present invention and is obtained by integrating the partitioning member with a bag-shaped flexible container formed of a film or a sheet. FIGS. 10 and 11 show this example. In this example, another communication means such as weak seal is used in combination.

Examples of the construction material of the flexible container include a polyolefin (for example, polyethylene, polypropylene, ethylene-propylene copolymer and a mixture of polypropylene and polyethylene or polybutene), a partially crosslinked product thereof, an ethylene-vinyl acetate copolymer (EVA), a polyester (e.g., polyethylene terephthalate, polyethylene naphthalate, polybutylene terephthalate) and a soft vinyl chloride. A single-layer or multilayer film or sheet comprising such a material and having a thickness of about 50 to 400 μm is shaped into a bag form and used. In this film or sheet, a barrier layer having an oxygen and/or water vapor barrier property may be provided according to the contents. Examples of the barrier layer include an

ethylene-vinyl alcohol copolymer, a polyamide, a polyvinylidene chloride, an aluminum foil, a resin film vapor-deposited with a silicon oxide, a resin film vapor-deposited with an aluminum oxide, and a resin film vapor-deposited with aluminum.

The bag body for use in the formation of a flexible container shown in FIGS. 10 and 11 is obtained by heat-sealing the peripheral edges of two sheets of film obtained by T-die molding or the like, but the present invention is not limited thereto and a tubular film obtained by inflation molding or the like may also be used.

For integrating the flexible container and the partitioning member, a method using an adhesive or by heat-sealing may be employed, but a method by heat-sealing is preferred because of no fear of mingling into the contents of the container. In performing the heat-sealing, the surface of the partitioning member is preferably preheated by the heating with use of radiant heat or metal mold. The heat-sealing is generally performed by a method of using a metal mold agreeing with the outer shape of the partitioning member, but may be performed by an impulse seal method, a high frequency seal method, an ultrasonic seal method or the like.

Also, as shown in FIG. 10A, a container having a V-shaped cut from both sides with the apex assigned to the partitioning member 1 is also preferred, because the communicating operation for the partitioning member 1 is facilitated and the portion where the contents reside after communication is decreased. It may also be possible to dispose, as shown in FIG. 10B, the partitioning member 1 at an edge and provide a cut only in one side.

An infusion container with multiple chambers using a seal part obtained by separably heat-sealing a synthetic resin for the partition part is known, but in this container, the inner pressure of the contents increases upon application of an external force and

causes a force acting in the direction of peeling off the weak seal part and therefore, prudent handling is required in all steps until immediately before use. The container using the partitioning member 1 of the present invention for the partition part has a very low possibility of causing improper communication through the partition part before use. Furthermore, in the case where the partitioning member used in the container has a support member 10 and undergoes bend deformation to cause rupture, the communication through the partitioning member as shown in FIG. 9B occurs only when the very limited conditions of adding a stress to three positions of both ends and center and at the same time, toward specific directions are satisfied, and therefore, communication by an external force beyond control does not occur.

INDUSTRIAL APPLICABILITY

When the partitioning member of the present invention is used in producing a container, a plurality of containers can be gaplessly melt-sealed to the partitioning member and at the same time, the process can be simplified. Also, on use of a container using the partitioning member of the present invention, the thin wall part is readily ruptured to communicate a plurality of containers and after the rupture, material which may be regarded as a foreign matter does not float. Accordingly, the container using the partitioning member of the present invention can be used in the food or medical field and therefore, this is useful.

The container of the present invention can unfailingly separate the contents such as food or medicament housed in a plurality of chambers before use and swiftly mix the contents immediately before use and can be used as a container in the food or medical field and therefore, this is useful.